Wildland Fire Policy and Resource Management Planning

Historical Perspective

Long before humans arrived in North America there was fire. It came with the first lightning strike and will remain forever. Unlike earthquakes, tornados, and wind, fire is a disturbance that depends upon complex physical, chemical, and biological relationships. Wildland fire is inherently neither good or bad, but it is the most powerful natural force that people have learned to use. As an inevitable natural force, it is sometimes unpredictable and potentially destructive, and along with human activities has shaped ecosystems throughout time.

Early ecologists recognized the presence of disturbance but focused on the principle that the land continued to move toward a stable or equilibrium condition. Through the years, however, scientists have acknowledged that equilibrium conditions are largely the exception and disturbance is generally the rule. Natural forces have affected and defined landscapes throughout time. Inasmuch as humans cannot completely control or eliminate these disturbances, ecosystems will continue to change.

Human activities also influence ecosystem change. Native Americans actively used fire in prehistoric and historic times to alter vegetation patterns. In short, people and ecosystems evolved with the presence of fire. This human influence shifted after European settlement in North America, when it was believed that fire could and should be controlled. For many years, fire was aggressively excluded to protect both public and private investments and to prevent what was considered the destruction of forests, savannahs, shrublands, and grasslands. While the destructive, potentially deadly side of fire was obvious and immediate, changes and risks resulting from these fire exclusion efforts were difficult to recognize and mounted slowly and inconspicuously over many decades.

Current Perspective

There is growing recognition that past land use practices, combined with the effects of fire exclusion, can result in heavy accumulations of dead vegetation, altered fuel arrangement, and changes in vegetative structure and composition. When dead fallen material (including tree boles, tree and shrub branches, leaves, and decaying organic matter) accumulates on the ground, it increases fuel quantity and creates a continuous arrangement of fuel. When this occurs, surface fires may ignite more quickly, burn with greater intensity, and spread more rapidly and extensively than in the past. On the other hand, uses such as grazing can sometimes reduce fine fuels, precluding periodic surface fires that would typically burn these areas. Without fire, encroachment of woody species may occur in some savannah and grassland ecosystems.

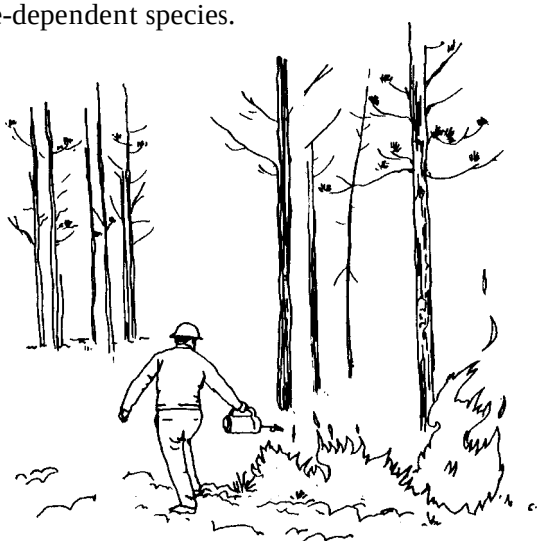
The arrangement of live vegetation also affects the way fires burn. For example, an increase in the density of small trees creates a multi-storied forest structure with a continuous vertical fuel arrangement. This arrangement may allow a fire normally restricted to the surface to spread into the trees and become a crown fire. In addition to structural changes, vegetation modification resulting from fire exclusion can cause a shift toward species that are not adapted to fire (some of which are not native) and are therefore more susceptible to damage from fire. Fire exclusion sometimes favors non-native species in some fire dependent areas, while in other areas fires may encourage non-native species.

Fires in areas of altered vegetation and fuels can adversely affect other important forces within an ecosystem, such as insects and disease, wildlife populations, hydrological processes, soil structure and mineralogy, and nutrient cycling. Any of these components, if altered greatly by usually severe fire, can seriously diminish the long-term sustainability of the land. In addition, effective protection from, and

control of these large fire events will likely be much more difficult.

Paradoxically, rather than eliminating fire, exclusion efforts, combined with other land use practices, have in many places dramatically altered fire regimes (circumstances of fires, including frequency, intensity, and spatial extent) so that today's fires tend to be larger and more severe. No longer a matter of slow accumulation of fuels, today's conditions confront us with the likelihood of more rapid, extensive ecological changes beyond any we have experienced in the past. To address these changes and the challenge they present, we must first understand and accept the role of wildland fire and adopt land management practices that integrate fire as an essential ecosystem process.

While other techniques, such as mechanical removal, may be used to reduce heavy fuels, they cannot always replace the ecological role that fire plays. Fire not only reduces the buildup of dead and downed fuel, it performs many other critical ecosystem functions. Fire can recycle nutrients that might otherwise be trapped for long periods of time in the dead organic matter that exists in many environments with slow rates of decay. It can also stimulate the production of nutrients and improve the specific conditions, including seed release, soil, light, and nutrients, that are critical for the reproduction of fire-dependent species.



Planning

Although ecological knowledge and theories have evolved relatively quickly, the scope and process of land management have had difficulty keeping pace. Ecological processes, including fire and other disturbances, and changing landscape conditions are often not integrated into land management planning and decisions. With few exceptions, existing land management planning is confined within individual agency boundaries and is based on single-program goals that are driven by agency missions and policies. Separate incompatible planning systems can also preclude the ecosystem perspective in land management planning. This type of planning can result in an inefficient, fragmented, short-term approach to management that tends to ignore broad, interdisciplinary-based, long-term resource issues that cross agency boundaries. Land management agencies now recognize these barriers and seek cooperative, ecologically sound approaches to land management on a landscape scale.

One way to break down these barriers is to involve all interests, including the public, scientists, resources specialists, and regulators, throughout the planning process. Another is to establish a clear link for communication and information transfer between scientists and managers. These measures will help to ensure that management needs are met and that current science is used in land management planning at all levels.

Planning must also consider the risks, probabilities, and consequences of various management strategies, e.g., fire versus fire exclusion. In a responsive planning process, management decisions must be monitored, integrated, and supported at each step. In order to carry out critical and effective "adaptive management" (a feedback approach to management that uses monitoring results to plan future actions), planners and managers need a nationwide baseline measure of ecological

conditions and a compatible method of assessing long-term ecological health by ecosystem type.

We must understand and accept the need to integrate wildland fire into land management plans and activities, and this integration must be reconciled with other societal goals, e.g., maintaining species habitat, producing commodities, and protecting air quality, water quality, and human health. Laws and regulations must consistently address long-term ecosystem processes and must guide agencies toward a common goal. Information about the consequences of various management strategies is not currently working toward and prioritizing simultaneous goals. Land management and regulatory agencies must interact and collaborate and must rely upon a continuous process of public involvement and feedback to achieve a balance of ecosystem and other societal goals.

Reintroduction of Fire

Several factors hinder the reintroduction of wildland fire on an ecologically significant scale. Even now it sometimes takes years to reach agreement about appropriate treatments and to take action. Land managers often feel the need to wait for scientific certainty before acting. This favors the status quo, impedes progress, and deters investigation of new techniques. In some ecosystems, little or no information is available about disturbance regimes, historical fire patterns, response to past management actions, and likely future responses. Information needed to reintroduce fire includes a well-planned, large scale scientific assessment of current ecosystem conditions and the consequences of various management strategies.

Another constraint is that fire management plans are not in place in all areas, thus precluding managers from taking advantage of the management options presented by wildland fires. Planning should consider all wildland fires, regardless of ignition sources, as opportunities to meet management objectives. In areas where planning has determined a range of appropriate management actions for the use of wildland fire, there will be more opportunities to safely and cost-effectively reintroduce fire. This approach will also make suppression resources available for the highest-priority situation. All wildland fire management actions will continue to be based on values to be protected, fire and land management objectives, and environmental conditions. In many situations, such as fires occurring in highly developed areas or during particularly severe weather, immediate initial attack and prompt suppression will still be required.

An additional contributing factor is the increasing human settlement that encroaches upon wildlands (wildland-urban interface). Such development divides and fragments wildlands, making it difficult to apply ecosystem-based management strategies. This increases the risk of escaped fire and generates complaints about smoke and altered scenic values. In these areas, the use of fire may be limited in spatial extent and, even where fire introduction is desirable, progress may be slow.

Smoke is perceived as a factor that may affect land managers' ability to use larger and more frequent wildland fire for restoration and maintenance of fire-dependent ecosystems. Several federal air quality programs under the Clean Air Act (CAA) regulate wildland fire emissions. The Environmental Protection Agency (EPA) is required to set air quality standards for pollutants that affect public health. States are then required to submit plans to ensure measures will be taken to meet those air quality standards. Local areas may also develop plans that may be more (but not less) restrictive than state and national standards.

In areas where air quality standards are violated, measures must be taken to reduce emissions. Emission control measures for fires that are used to meet

management objectives include smoke management techniques that minimize and disperse smoke away from smoke-sensitive areas. Smoke from fires may also cause standards to be exceeded in communities miles away from the source. Currently, prescribed fires are not considered to be a significant cause of non-attainment, but with increased burning to reduce fuels and restore or maintain ecosystem health, this may change. In many areas, fire managers and local air quality authorities have successfully worked together to accomplish fire and land management objectives, resolve conflicts with smoke emissions, and avoid violation of air quality standards. With guidance from the national level to provide consistent interpretation, further cooperation at the local level will help to achieve a balance of air quality and other ecosystem goals.

Fire is a unique tool that land managers can use to complement agency missions and land management objectives. But in order to successfully integrate fire into natural resource management, informed managers, partners, and the public must build upon sound scientific principles. Before fire is applied on an ecosystem-scale, an understanding of historic fire regimes, as well as a knowledge of the current conditions of each system, is needed. Then all parties must work together in the land management planning and implementation process according to agreed-upon goals for the public welfare and the health of the land.

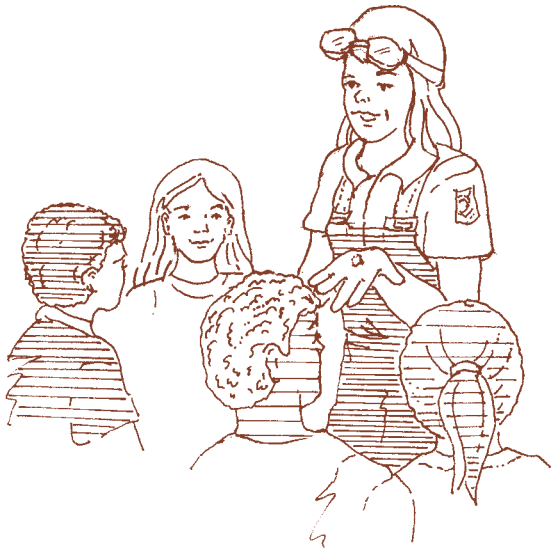
Education

For many people, fire remains a fearsome, destructive force that can and should be controlled at all costs. Smokey Bear's simple, time-honored "only you" fire prevention message has been so successful that any complex talk about the healthy, natural role of fire and the scientific concepts that support it are often lost by internal and external audiences. A comprehensive message is needed that clearly conveys the desired balance of avoiding fires with adverse affects while simultaneously increasing ecologically beneficial fire.

The ecological and societal risks of using and excluding fire have not been adequately clarified and quantified to allow open and thorough discussions among managers and the public. Few understand that integrating fire into land management is not a onetime, immediate fix but a continual, long-term process. It is not an end in itself but a means to a more healthy end. Full agency commitment to internal and external information and education regarding fire and other ecological processes is needed. Adaptive and innovative fire and land management is severely limited when agency employees and the public misunderstand or remain skeptical about the role of fire.

The Task

The task before us — reintroducing fire — is both urgent and enormous. Conditions on millions of acres of wildlands increase the probability of large, intense fires beyond any scale yet witnessed. These severe fires will in turn increase the risk to humans, to property, and to the land upon which our social and economic well-being is so intimately intertwined.



Recommendation: Planning

Goals

- Fire management goals and objectives, including the reintroduction of fire, are incorporated into land management planning to restore and maintain sustainable ecosystems. Planning is a collaborative effort, with all interested partners working together to develop and implement management objectives that cross jurisdictional boundaries.

- Clearly defined fire management goals, objectives, and actions are developed and updated in comprehensive fire management plans. The use of fire to sustain ecosystem health is based on sound scientific principles and information and is balanced with other societal goals, including public health and safety, air quality, and other specific environmental concerns.

Actions

Federal agencies will:

- Use a compatible fire management planning system that recognizes both fire use and fire protection as inherent parts of natural resource management. This system will ensure adequate fire suppression capabilities and support fire reintroduction efforts.

- Develop fire management plans for all areas subject to wildland fires. These plans will:
  - ✓ use information about fire regimes, current conditions, and land management objectives as a basis to develop fire management goals and objectives;
  - ✓ address all potential wildland fire occurrences and include a full range of fire management actions;
  - ✓ use new knowledge and monitoring results to revise fire management goals, objectives, and actions;
  - ✓ be linked closely to land and resource management plans.

- Develop research programs that will provide a sound scientific basis for the integration of wildland fire into land-use and resource management.

- Create a system for coordination and cooperation among land managers and regulators that explores options within existing laws to allow for the use of fire to achieve goals of ecosystem health while at the same time protecting individual components of the environment, human health, and safety. This system will:
  - ✓ allow for early collaboration during the process of developing new land management plans and provide a mechanism for incorporating input as existing plans are implemented or revised;
  - ✓ encourage land managers and regulators to enter into agreements that set forth the actions each will take before and during the time fire is reintroduced in their area of responsibility.

- Continue ongoing efforts to jointly develop compatible, ecosystem-based, multiple-scale, interagency land management plans that involve all interested parties and facilitate adaptive management. This process will:
  - ✓ fully integrate ecological concepts that consider long-term dynamics and cross agency boundaries;
  - ✓ effectively incorporate current fire-related information, including scientific knowledge, risk assessment, social and economic concerns, and public health considerations;

- ✓ ensure that existing land management plans are revised or updated to address the above actions.

Recommendation: Reintroduction of Fire

Goal

- Based upon sound scientific information and land resource and fire management objectives, wildland fire is used to restore and maintain healthy ecosystems and to minimize undesirable fire effects. Fire management practices are consistent for areas with similar management objectives, regardless of jurisdiction.

Actions

Federal agencies will:

- Expedite the decision-making process by jointly developing criteria for evaluating ecosystem conditions by ecosystem type and for prioritizing areas for the reintroduction of fire to meet resource objectives and reduce hazards. This process will identify those ecosystems:
  - ✓ where fire does not need to be reintroduced (fire is not a significant natural component or the fire regime has not been altered);
  - ✓ where fire is unlikely to succeed (fire would be adverse, such as areas significantly altered by fuel accumulations and species changes); determine appropriate, ecologically sound alternatives for these areas;
  - ✓ where treatment with fire is essential or potentially effective (fire is needed to improve resource conditions or reduce risk and hazard).

- Jointly implement ecosystem-based fire management programs to accomplish resource or landscape objectives when consistent with land management plans. These programs will:
  - ✓ strive to maintain the long-term integrity of the natural resource and minimize the undesirable effects of fire;
  - ✓ address the highest priority need in ecosystem assessment, monitoring, and management, and determine the appropriate scope of fire use, consistent with historical fire regimes, including extent, timing, risks, and consequences;
  - ✓ use existing tools and develop new ones to address today's more fragmented landscapes, and to enhance our ability to manage wildland fires of varying size and intensity;
  - ✓ illustrate the management actions and their results by establishing or expanding fire management demonstration areas.

- Conduct collaborative fire research programs to improve the predictive understanding of wildland fire and its relationship to ecosystem dynamics, and to strengthen the technological capabilities and organizational framework necessary to sustain the role of fire in natural ecosystems.

Recommendation: Education

Goal

- Clear and consistent information is provided to internal and external audiences about existing conditions, management goals and objectives, the role of fire in achieving these objectives, and alternatives and consequences of various fire management strategies. As a result, informed audiences participate fully in the land and fire management planning process.

Actions

Federal agencies will:

- Establish an interdisciplinary team that includes

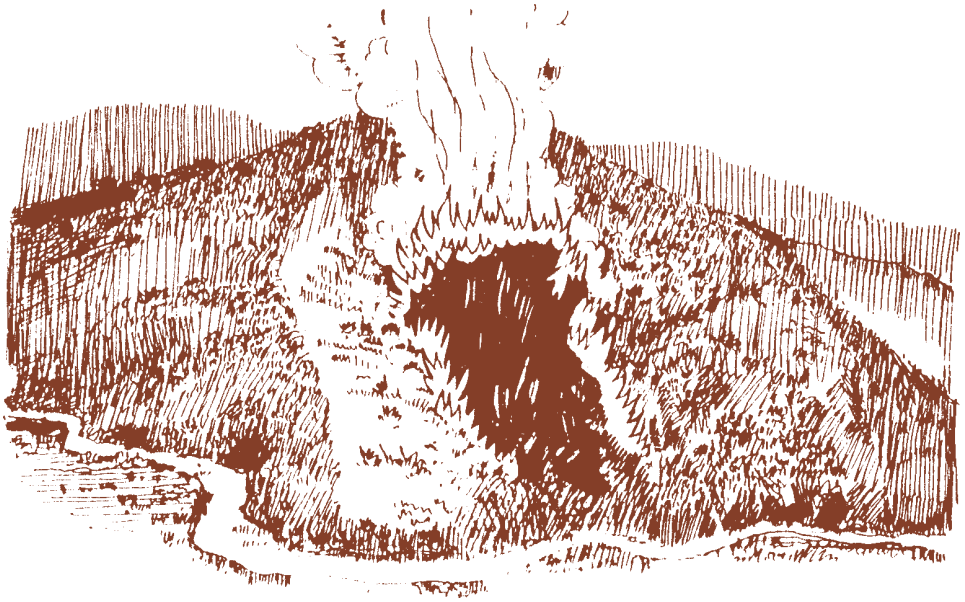
all agencies, regulators, and other partners to design a consistent fire-role and use-message for decision makers and the public. This message will:

- ✓ describe and clearly explain issues such as ecosystem conditions, risks, consequences (including public health impacts), and costs in open dialogue with internal and external constituents;
- ✓ be designed to maximize open communications and reduce polarization among conflicting interests regarding the use of fire.

- Build on existing interagency efforts to develop and implement a strategic plan that educates the general public and agency personnel about the role of fire. As part of this effort, agencies will:
  - ✓ develop and widely transmit a clear message about the important role of fire as a natural process and the risks and consequences of its use and exclusion;
  - ✓ integrate this message into existing agency communication systems, agency and partner initiatives (such as forest health, ecosystem management, etc.), and all external outreach efforts, including television, magazines, newspapers, and public meetings;
  - ✓ encourage, create, and coordinate partnerships to achieve consistency in messages, build public trust, and obtain public opinion;
  - ✓ develop mandatory national and regional interagency training programs to instill in all employees an understanding of the role of fire in natural systems.

Source

U.S. Department of the Interior and U.S. Department of Agriculture. 1995. "Role of Wildland Fire in Resource Management." In *Federal Wildland Fire Management: Policy & Program Review, Final Review*. pp. 7–12.



Wildland Fire and an Ecosystem Approach to Management

Many natural resource agencies in the United States are adopting ecosystem approaches to management. These approaches integrate ecological principles, human systems, and the goals of sustainability, permanence, and resiliency into the practices of resource management agencies. These approaches focus on stewardship of systems using integrative and adaptive management practices rather than focusing primarily on commodities (e.g., board-feet, select wildlife species, or recreation days). Ecosystem approaches to management are practiced on landscape-scale levels that extend beyond the formal jurisdictional boundaries of any one agency.

This concept has grown out of the combination of pressure to meet emerging societal values involving natural resources, and development of the science of ecology to the point where it can be used for management planning and decision-making (Grumbine, 1994; Albert, 1995). Development of ecosystem management has been more evolutionary than revolutionary (Franklin, 1997).

The Ecological Society of America (Christensen, et al., 1996, pp. 665-666) stated that ecosystem management is based on eight central elements:

1. Sustainability

Ecosystem management does not focus primarily on "deliverables" but rather regards intergenerational sustainability as a precondition.

2. Goals

Ecosystem management establishes measurable goals that specify future processes and outcomes necessary for sustainability.

3. Sound ecological models and understanding

Ecosystem management relies on research performed at all levels of ecological organization.

4. Complexity and connectedness

Ecosystem management recognizes that biological diversity and structural complexity strengthen ecosystems against disturbance and supply the genetic resources necessary to adapt to long-term change.

5. The dynamic character of ecosystems

Recognizing that change and evolution are inherent in ecosystem sustainability, ecosystem management avoids attempts to "freeze" ecosystems in a particular state or configuration.

6. Context and scale

Ecosystem processes operate over a wide range of spatial and temporal scales, and their behavior at any given location is greatly affected by surrounding systems. Thus there is no single appropriate scale or time frame for management.

7. Humans as ecosystem components

Ecosystem management values the active role of humans in achieving sustainable management goals.

8. Adaptability and accountability

Ecosystem management acknowledges that current knowledge and paradigms of ecosystem function are provisional, incomplete, and subject to change. Management approaches must be viewed as hypotheses to be tested by research and monitoring programs.

The Ecological Society of America (Christensen, et al., 1996, p. 666) continues the discussion by stating that four fundamental scientific precepts guide ecosystem management. These are:

1. Spatial and temporal scale are critical

Ecosystem function includes inputs, outputs, cycling of materials and energy, and the interactions of organisms. Boundaries defined for the study or

management of one process are often inappropriate for the study of others; thus, ecosystem management requires a broad view.

2. Ecosystem function depends on its structure, diversity, and integrity

Ecosystem management seeks to maintain biological diversity as a critical component in strengthening ecosystems against disturbance. Thus, management of biological diversity requires a broad perspective and recognizes that the complexity and function of any particular location is influenced heavily by the surrounding system.

3. Ecosystems are dynamic in space and time

Ecosystem management is challenging in part because ecosystems are constantly changing. Over time, scales of decades or centuries, many landscapes are altered by natural disturbances that lead to mosaics of successional patches of different ages. Such patch dynamics are critical to ecosystem structure and function.

4. Uncertainty, surprise, and limits to knowledge

Ecosystem management acknowledges that, given sufficient time and space, unlikely events are certain to occur. Adaptive management addresses this uncertainty by combining democratic principles, scientific analysis, education, and institutional learning to increase our understanding of ecosystem processes and the consequences of management interventions, and to improve the quality of data upon which decisions must be made.

Grumbine (1994, p. 31) lays out five specific goals that frequently appear in ecosystem management:

1. Maintain viable populations of all native species in situ.
2. Represent, within protected areas, all native ecosystem types across their natural range of variation.
3. Maintain evolutionary and ecological processes (i.e., disturbance regimes, hydrological processes, nutrient cycles, etc.).
4. Manage over periods of time long enough to maintain the evolutionary potential of species and ecosystems.
5. Accommodate human use and occupancy within these constraints.

Based on these views of ecosystem management, it is clear that maintenance or restoration of natural disturbance regimes are necessary components. However, these regimes must somehow be integrated into the human use and occupancy component.

Fire is an important element of many ecosystems, and is necessary for some species to complete their life cycles. In a review of 90 ecosystem management projects in the United States, Yaffee et al. (1996) found that in 34% of the projects that disrupted the natural fire regime an important human-caused stress on the ecosystem was considered. For ecosystem management to maximize its potential to help restore healthy ecosystems, restoration of natural fire regimes are needed in many areas.

Expanding prescribed fire on public or private land seems to be a relatively easy and biologically sound approach to restoring ecological integrity. However, problems often arise when we attempt restoration at a landscape scale, especially across political, jurisdictional, and social boundaries. We know prescribed fire can be ecologically beneficial as part of an ecosystem management plan, and can be economically beneficial by reducing fuel loads and improving the quality of the resource. Yet human biases against wildland fires, based on real and perceived risks of destruction of property, loss of life, air pollution, and other factors make prescribed fire difficult to implement.

For example, the lodgepole pine fire regime includes very infrequent, but high intensity crown fires as part of the natural life cycle of the forest.

These fires are difficult to manage and can easily cross jurisdictional boundaries, threatening human communities. Yet suppressing fire in lodgepole pine ecosystems might change the biological community in a manner not fitting the goals of ecosystem management, or may cause continued buildup of fuel loads, thus increasing the likelihood of extreme fires. Current fire management programs struggle with these difficulties. While the amount of land burned under prescription is increasing in wildlands, the total acreage in the wildland-urban interface zone, because of structural density and structural proximity to the fuel sources, preclude extensive use of fire as a tool for reducing fuel loads. Thus, total landscape focus is problematic.

The U.S. Forest Service points out that avoiding prescribed treatments of the land has the following effects:

- Change from relatively low damage, stand-maintenance fires to more severe high damage, stand-replacement fires.
- Conversion from fire-resistant species to fire-intolerant species having less resilience to fire disturbances.
- Less controllable and more costly wildland fires.
- Increasing danger to firefighters.
- Growing threat to wildland/urban interface values where development is occurring in fire prone types.
- Increasing potential for higher particulate matter emissions as fuel loads and understory biomass increase.

Agencies often point to the southeastern forest fire regimes of the United States, where large-scale prescribed burning has occurred in the form of short interval fires since the 1930s, to show that their forest health problems are much less extensive when compared to national trends. Even in the southeast, though, prescribed fire is no panacea; it is only a useful tool. The rapid growth of vegetation during a warm, wet growing season, followed by an extreme dry period in the early summer of 1998 left Florida vulnerable to large, intense fires. Approximately one half million acres burned; the ecosystems of north and central Florida received extensive fire. The situation was exacerbated by widely distributed housing developments tucked into pine and scrub communities. In these areas, prescribed burning had not been extensive enough even though Florida has more acreage of prescribed burns annually than any other state. These wildland-urban interface zones had heavy fuel loads and required much of the firefighting resources.

While aggressive fire suppression is still a dominant strategy to protect lives, property, and highly valued natural and cultural resources, prescribed fire is key to ecosystem restoration. Ecosystem management planning at landscape scales must reflect a comprehensive approach for near-term suppression and long-term periodic burning of fire-dependent natural communities using prescribed fire.

Ecosystem management, because of its cross-jurisdictional, cross-boundary perspective, requires a dedication to conflict management. Competing interests often arise; the issues of fire prescription and fire prevention are good examples. Many publics will have negative perceptions of fire because of past media campaigns. Wildland fire communication has traditionally carried the message of prevention. A parallel message is now needed, i.e., that fires, both prescribed and wildland fire, are necessary to maintain ecosystem health.

Risks exist for natural resource managers in addressing ecological problems beyond a legal or jurisdictional boundary; ecosystem approaches cross these boundaries. Property rights issues must be understood, and sensitivity to them is necessary for good ecosystem management to occur.

However, ecosystem management is more about community responsibility than it is about interfering

with any individual's or agency's rights. Ecosystem approaches to natural resource management include creating and valuing open dialogues in both communities of place (residents) and communities of interest (nonresidents who have a vested interest) regarding resource management activities.

Wildland fire policy and practice are central to ecosystem management success. Likewise, full implementation of enlightened ecosystem management will, to a great extent, determine if wildland fire management will move beyond annual suppression to a proactive stance of using "fire to prevent fire" and restore ecosystem health.

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